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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,724	01/14/2002	Anthony P. Hoult	COHD-4540	7718

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EXAMINER	
PADGETT, MARIANNE L	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 04/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/050,724	HOULT ET AL.	
	Examiner	Art Unit	
	Marianne L. Padgett	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/14/02, 3/22/03 & 4/14/03*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *1/14/02, 3/22/03* & 4/14/03
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

1. Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A matrix is a material in which other materials is enclosed or embedded, such as particulates or the like, and it is unclear in the claims how the "thermally hardenable organic matrix" is acting as or being used as a matrix. Neither a liquid nor a layer is a "matrix" *per se*, nor does is appear that the light absorbing material is what it is acting as a matrix for, as the dependant claim where it is a dye, is not necessarily consistent with such an interpretation, although the particulate nature for carbon black or metal powder could be consistent therewith. Lacking clear use as a matrix, coating and layer depositions will also be considered to read on claims as written. Does applicant actually mean --encapsulate--, as implied by claims 9-22 encapsulating process?

In claims 5 and 14 "said thermally convertible liquid matrix" (emphasis added) lacks proper antecedent basis due to inconsistent terminology.

In claims 15 and 19, step (b) lacks an appropriate connecting phrase between "a...matrix" and "at least one material...", i.e. the step phrasing is fragmented, such that it is uncertain if the absorbing material is included in the matrix as in claims 1 or 9, or may merely be somehow associated therewith, but not necessarily part of the "matrix".

In claim 19, step (b) introduces "a...liquid organic matrix", which is sort of used in step (c) and treated in (e), but step (f) uses the term "said light absorbing material containing, liquid epoxide layer" which has no antecedent basis in the preceding claim steps. In fact, it appears the

claim 20 was actually intended to introduce "epoxide". Note step (c) has antecedent basis problems, because (b) does not require "containing".

Similarly in claim 15, step (e) "said layer of light absorbing material containing, liquid organic matrix" lacks proper antecedent basis, as the matrix is not required to contain the absorbing material, which was also NOT defined as a layer!

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 15-16, 18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blais et al (5,457,299).

Blais et al teach curing an encapsulant on a semiconductor chip by heat generated via a laser pulse, conducted through the clip, which acts as a light absorbing material. Suitable lasers are taught to have wavelengths in the near infrared region, such as 630-730 nm (alexandrite), 680 nm (Ruby) or conventional diode lasers (800-1000 nm). The light is delivered to the desired site of curing via optical fiber, in order to concentrate light effectively at a small point. Blais et al teach that the encapsulant may comprise conventional epoxy. See the abstract; Fig. 1; Summary, esp. col. 1, lines 35-40 and 58-65; col. 2, lines 29-67.

Note claim 15 and its dependant's are included due to the above noted confusion in its limitations concerning the "liquid organic matrix" and the light absorbing material, where for steps (a)-(d) they may be separate materials as employed in Blais et al, and step (e) lacks the proper connecting antecedence, however, should the configuration of this last step apply to the whole claim, Blais et al's process would not read thereon.

These claims require a "diode-laser array", and in claim 15, an optical fiber bundle, while the disclosure of Blais et al discusses laser and optical fiber only in the singular, however number of sources (i.e. singular verses plural) is not a patentably significant difference, since it would have been obvious to one of ordinary skill in the art to employ single laser/fiber or arrays thereof depending on the desired number and arrangement of small points, i.e. semiconductor chips to be encapsulated, especially considering that using the same equipment or conveying system to pass many chips past an array, verse singular ones past, would have been known to be more economical when large number are desired to be encapsulated.

While Blais et al provide no percentages of absorbed radiation (relates to claim 22), the heat radiating via convection though the chip may be considered to be 100% absorbed. Note

claim 22 does not actually necessitate that the wavelength and radiation are referring to the same limitation, nor is there any light absorbing material required to be contained in or part of the "matrix", hence the application of Blais et al against this claim.

4. The German patent DE 19640006A to Brunner et al is given the same rating by the PCT search report (X for claims 1-18 and 22) as the above Blais et al reference, but while the Derwent English abstract supplies teachings on taught laser for hardening and epoxy for encapsulant with laser irradiation from the encapsulant side, whether or not the laser causes a thermal process is not in the abstract. However, the teaching of using the process to make individual components or arrays, supports the above contention concerning the obviousness of plural verses singular. A translation has been ordered from the PTO translation division of the scientific Library, but not yet received.

Kuizenga et al (6,007,664) cited by applicant is noted to employ a laser induced thermal curing process for epoxy analogous to that of Blais et al, but for slider head/suspension assembles.

5. Claims 1-7, 9-11 and 13-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brunner et al (DE 19640006A), in view of Schoen et al (5,242,715) and Gelbart (6,214,276 B1).

As shown by the English abstract to Brunner et al, this German patent teaches "high-hardening" a coating or casing layer of polymer that may be epoxy (i.e. an epoxide), using laser radiation that may be IR. The substrate may be an electronic component, on which a casing is being formed by this technique (encapsulation). Whether the hardening of the plastic or epoxy layer occurs due to thermal and/or photo mechanisms is not indicated, only that the techniques is

superior to prior expensive thermal techniques. Schoen et al, who may be employed for analogous coating of electronic components, also using epoxy, teach a technique using both UV radiation and thermal to cause curing, where it is taught that the thermal radiators employed for the thermal curing may include IR lasers (or an IR component of the UV source) and that the coating liquid mixture contains an initiator capable of being thermally activated thereby, i.e. light absorbing material. Furthermore, dyes, pigments and carbon black are taught as common additives, with the later specifically mention as necessary for coating of IC's on printed circuit boards. See the abstract; col. 1, lines 7-35; col. 2, lines 15-68; col. 4, lines 32-56; col. 5, lines 5-25 and 36-68 and col. 6, lines 57-68. Therefore, given the teachings of Brunner et al and Schoen et al, it would have been obvious to one of ordinary skill in the art to employ IR lasers, as suggested by both references, to thermally cure epoxy encapsulating coatings provided on electronic components, where absorbing material and carbon black are in the coating, as Schoen et al shows thermally curing to be effective for such appropriate epoxy mixtures.

However, neither Schoen et al nor Brunner et al specify use of particular IR wavelengths, and while Brenner et al's abstract appears to suggest the use of laser diodes, possibly in arrays, the phrasing is somewhat cryptic.

Gelbart teaches the use of laser beams to thermally cure thermo-sensitive resin that may be epoxy and may include a suitable dye to cause the resin to absorb at a suitable wavelength. The preferred part of the IR spectrum is taught to be 800-1200 nm, with use of laser diodes, typically 830 nm suggested. While Gelbart is teaching making 3-D objects, he further teaches that his techniques is advantageous to scanning single layers due to the low cost of the diode lasers, verse the use of expensive layers in previous curing procedures. Also, the thermal curing

is taught to be advantageous, since scattered light will not effect undesired curing, as it will lack in the intensity to cause sufficient heat to cure. In Gelbart, see the abstract; col. 2, lines 1-10, 22-41 and 60- col. 3, line 10 and lines 47-63; and col. 4, line 63 – col. 5, line 20. Note that the use of an array of laser diodes is disclosed for advantageous use. Given the advantages of thermally curing epoxy resins with absorbing material as discussed by Gelbart, it would have been obvious to employ such mixtures and lasers in Brunner et al, as Gelbart shows the techniques has the desired cost advantage over the prior art, and Schoen et al and Brunner et al's mentioned prior art, indicate that thermal curing techniques have been both known and effective for the specific and use claimed. Also, Gelbart adds significance to the diode and array discussions of Brunner et al, in association with laser usage of the appropriate wavelengths. As discussed in Gelbart, choice of wavelength will depend on aborting material, and visa versa. While no specific percentages of radiation absorbed are discussed, it would have been obvious to one of ordinary skill in the art to employ adequate absorbing material to achieve sufficient light absorption to cause taught curing, and percentages would depend on intensity and conversion efficiency required to produce curing temperatures of particular epoxy resin mixtures.

6. Claims 8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brunner et al, in view of Schoen et al and Gelbart as applied to claims 1-7, 9-11 and 13-22 above, and further in view of Busman et al (5,756,689).

The above combination does not include metal powder as an absorbing material employed in the encapsulant (matrix) mixture, however Busman et al who also desires polymeric materials that contain laser absorbing materials inclusive of IR absorbers (dye, carbon black, black Al_2O_3, etc.), that may be employed to encapsulate electronic components on printed circuit

boards, specifically suggest use of metal particulates in such encapsulating material (abstract; col. 1, lines 31-43; col. 7, lines 10-60). Therefore, it would have been obvious to such materials, which are known and typical in the claimed encapsulating material, as they are also seen to be effective and acceptable in encapsulant material required to absorb IR radiation from a laser.

7. Other art of interest for discussion of use of IR absorbing materials in polymers, treated by laser radiation, include Fleming et al 6,159,657 – IR dye or carbon black); Lawton (RE 37,875 E – col. 16, graphite or thermal dye, diode laser); Bedingham et al (2002/0047003 – [0241]); Schädeli et al (col. 41, lines 1-16); and Levinson et al (col. 3 and 5).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on Monday-Friday from about 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Beck Shrive can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Padgett/LR
April 16, 2004

MARIANNE PADGETT
PRIMARY EXAMINER